Five-Year Review Report

American Chemical Service, Inc. Superfund Site

Griffith, Indiana

Cover: Sunrise over restored wetlands at the ACS Superfund site (Spring 2002).

Eighteen inches of wetland sediment impacted by PCBs were removed during August-September 2001. Afterwards, the 1.5-acre cleanup area was over-excavated to a depth of about 10 feet to create a pond.

Photograph courtesy of Peter Vagt, Montgomery Watson Harza (MWH)

Second Five-Year Review Report

American Chemical Service, Inc. Superfund Site

Griffith
Lake County, IN

April 2006

PREPARED BY:

U.S. Environmental Protection Agency

Chicago, IL

Approved by:

Richard C Karl

Richard C. Karl, Director
Superfund Division
U.S. EPA

Date:

4-6-06

Aerial photograph of the ACS site viewed from the northeast (Summer 2003).

Colfax Street is on the left side of the view; the "Off-Site Area" is the grassy area at the top of the photo; and the ACS facility is in the center, bordered by the trees at the bottom.

Photograph courtesy of MWH.

ACS Second Five-Year Review Report

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List of Acronyms

ACS	American Chemical Service, Inc.
BWES	Barrier Wall Extraction System
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
ESD	Explanation of Significant Differences
FML	Flexible Membrane Liner
GWTP	Groundwater Treatment Plant
ICs	Institutional Controls
ICTS	Institutional Controls Tracking System
IDEM	Indiana Department of Environmental Management
ISVE	In-situ Soil Vapor Extraction
K-P Area	Kapica-Pazmey Area
mg/kg	Milligrams per kilogram
MNA	Monitored Natural Attenuation
NCP	National (Oil and Hazardous Substances Pollution) Contingency Plan
NPL	National Priorities List
OFCA	Off-site Containment Area
ONCA	On-site Containment Area
ORC	Oxygen-Releasing Compound
O&M	Operation and Maintenance
PCBs	Polychlorinated Biphenyls
PCOR	Preliminary Closeout Report
PGCS	Perimeter Groundwater Collection System
ppb	Parts per Billion
ppm	Parts per Million
PRP	Potentially Responsible Party
RA	Remedial Action
RD	Remedial Design
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
SBPA	Still Bottoms Pond Area
SVOCs	Semi-Volatile Organic Compounds
VOCs	Volatile Organic Compounds
U.S. EPA	United States Environmental Protection Agency
UU/UE	Unlimited Use and Unrestricted Exposure

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Executive Summary

The American Chemical Service, Inc. (ACS) National Priorities List (NPL) site is located in Griffith, IN. It is comprised of about 19 acres of American Chemical Service, Inc.-owned or leased property which includes the so-called "Off-Site Containment" and the "On-Site Containment" areas, the 2-acre property known as the "Kapica-Pazmey" property, and portions of CSX Transportation Company-owned land that had been impacted by past ACS waste disposal practices. Land around the site is primarily used for industrial purposes although there are several single-family residences and a prairie park nearby.

ACS began a solvent recovery business on its property in May 1955. Poor waste handling, storage, and disposal practices led to the contamination of the site to the extent described in U.S. EPA's 1992 Record of Decision (ROD) and later documents. ACS ceased its solvent reclaiming activities upon losing its interim status under the Resource Conservation and Recovery Act (RCRA) in 1990, although it continues its specialty chemical manufacturing operations to this day.

U.S. EPA identified the principle threats at the ACS site as including buried chemical drums, buried wastes, contaminated soil and debris, and contaminated groundwater and surface water. We determined that buried wastes and contaminated soil and debris were a continuing contaminant source to groundwater and that they would pose a direct contact threat should the material be excavated. We also determined that the material could pose an inhalation threat due to movement of volatile organic compounds (VOCs) through existing cover material with possible dispersion of the contaminants into the neighboring community.

U.S. EPA issued a Record of Decision (ROD) in September 1992. Some of the ACS site potentially responsible parties (PRPs) conducted pre-design investigations in 1995 and voluntarily constructed site stabilization remedial measures in 1996 and 1997. U.S. EPA issued a ROD Amendment in July 1999 that incorporated the 1996/1997 stabilization measures and additional protective remedial actions into the amended cleanup remedy.

The amended cleanup remedy for the ACS site consists of the installation of a subsurface barrier wall around the site to contain buried wastes in place; the installation of a groundwater extraction system inside the barrier wall to create an inward hydraulic gradient and outside the wall to clean up a contaminant plume; the installation and operation of a groundwater treatment plant to process contaminated groundwater; the removal of buried chemical drums; the excavation of polychlorinated biphenyl (PCB)-impacted sediment from adjacent wetlands; the placement of soil and/or engineered covers over certain areas of the site; the installation and operation of in-situ soil vapor extraction systems to remove VOCs from soil; the application of a chemical oxidant into an impacted soil area to destroy a source of VOCs (preventing further groundwater

contamination); and the performance of groundwater monitoring tasks including limited, yearly residential well sampling.

U.S. EPA and over 40 PRPs signed a consent decree in January 2001 that covered the construction and operation and maintenance of the final cleanup remedy for the ACS site. Construction completion status was achieved in September 2004 and further remedy enhancements were constructed in 2005. Operation and maintenance of the site remedial actions is ongoing.

U.S. EPA issued the first Five-Year Review for the ACS site in April 2001. Because the final cleanup work had just begun under the consent decree, we issued a "Type 1a" report. We determined in 2001 that the remedy was protective of human health and the environment because interim cleanup measures had been completed and construction of the final remedial components was (just) underway.

U.S. EPA performed the second Five-Year Review for the ACS site during the latter half of 2005 and into early 2006. We determined that the now-completed cleanup remedy is operating as designed and that it is protective of human health and the environment.

Excavation of PCB-impacted sediment from the wetland area (Fall 2001)

Excavated sediment testing results were below 50 ppm PCBs, so the material was consolidated on the ACS property underneath an engineered cap. Cover photograph was taken from the same area the following spring.

Photograph courtesy of MWH.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name: American Chemical Service, Inc. ("ACS")

EPA ID: IND016360265

Region: 5	**State**: IN	**City/County**: Griffith - Lake County

SITE STATUS

NPL status: **XX Final** ☐ Deleted ☐ Other (specify)

Remediation status: ☐ **Under Construction** ☐ **Operating** **XX Complete**

Multiple OUs? ☐ **YES** XX NO	**Construction completion date:** September 27, 2004

Has site been put into reuse? XX YES ☐ **NO** (ACS, Inc. is an operating facility.)

REVIEW STATUS

Lead agency: XX **U.S. EPA** ☐ State ☐ Tribe ☐ Other Federal Agency

Author name: Kevin Adler

Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA - Superfund

Review period: 09/01/2005 to 01/31/2006

Date(s) of site inspection: 09/22/2005

Type of review:

XX **Post-SARA** ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☐ 1 (first) **XX 2 (second)** ☐ 3 (third) ☐ Other (specify)

Triggering action:

☐ Actual RA Onsite Construction at OU #____
☐ Actual RA Start at OU#____
☐ Construction Completion
XX Previous Five-Year Review Report
☐ Other (specify)

Triggering action date: 04/05/2001 (Signature date of first Five-Year Review report.)

Due date for Second Five-Year Review Report: 04/05/2006

Issues:

We identified the following minor issues during this Five-Year Review:

1. A Lower Aquifer groundwater plume investigation is underway in the northern area.
2. The fourth chemical oxidant application is pending in the southern area.
3. The Institutional Controls Study is not complete.

Recommendations and Follow-up Actions:

1. Complete the lower aquifer investigation and recommend and implement a response action.
2. Complete the chemical oxidant application as planned.
3. Complete the Institutional Controls Study as recommended.

Protectiveness Statement(s):

The cleanup and containment remedy is operating as designed and it is protective of human health and the environment.

Other Comments:

None.

Five-Year Review Report

I. Introduction

The United States Environmental Protection Agency (U.S. EPA) Region 5, in consultation with the Indiana Department of Environmental Management (IDEM), has conducted the second Five-Year Review for the American Chemical Service, Inc. (ACS) Superfund site, Griffith, Indiana. We conducted this review from September 2005 through January 2006 with information and assistance from Montgomery Watson Harza (MWH), the prime contractor hired by the ACS potentially responsible parties (PRPs) to conduct the many remedial actions at the site. This report documents the results of the second Five-Year Review at the ACS site.

Purpose

U.S. EPA conducts a Five-Year Review to determine whether a cleanup remedy at a site is, or is expected to be, protective of human health and the environment. We document our review methods, findings, and conclusions in Five-Year Review reports. In addition, we identify any issues that we found during our review of site cleanup remedies in Five-Year Review reports and we make recommendations on ways to address these issues.

Authority

U.S. EPA prepared this Five-Year Review report pursuant to CERCLA § 121 and the National Contingency Plan (NCP). CERCLA § 121 states:

> If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

U.S. EPA interpreted this requirement further in the NCP - 40 CFR § 300.430(f)(4)(ii) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

Triggering Action

U.S. EPA selected a containment and treatment remedy in the 1999 ROD Amendment. Therefore, after all remedial actions are completed we still expect to see hazardous

substances left on site above levels that allow for unlimited use and unrestricted exposure (UU/UE) and they will be left on site into the foreseeable future.

The triggering action for this second Five-Year Review is the first Five-Year Review for the ACS site which we issued on April 5, 2001. Therein we stated that we shall undertake future Five-Year Reviews as long as hazardous substances remain on site above levels that allow for UU/UE.

II. Site Chronology

Table 1 summarizes the site chronology to date.

Table 1: Chronology of Site Events

Event	Date
Initial discovery of contamination (by State)	**1972**
Pre-NPL responses (by State)	**1972-1975**
NPL Listing	**September 1984**
RI/FS Completion and ROD Signature	**September 1992**
ROD Amendment	**July 1999**
Consent Decree	**January 2001**
Remedial Design Start	**1997**
Remedial Design Completion	**August 1999**
Final Remedial Action Start	**January 2001**
Construction dates (start, finish)	**1996 through 2005**
Construction completion (PCOR)	**September 2004**
Final Closeout Report (RA Report)	**September 2005**
Previous Five-Year Review	**April 2001**
Site Inspection date(s) – Second review	**September 2005**

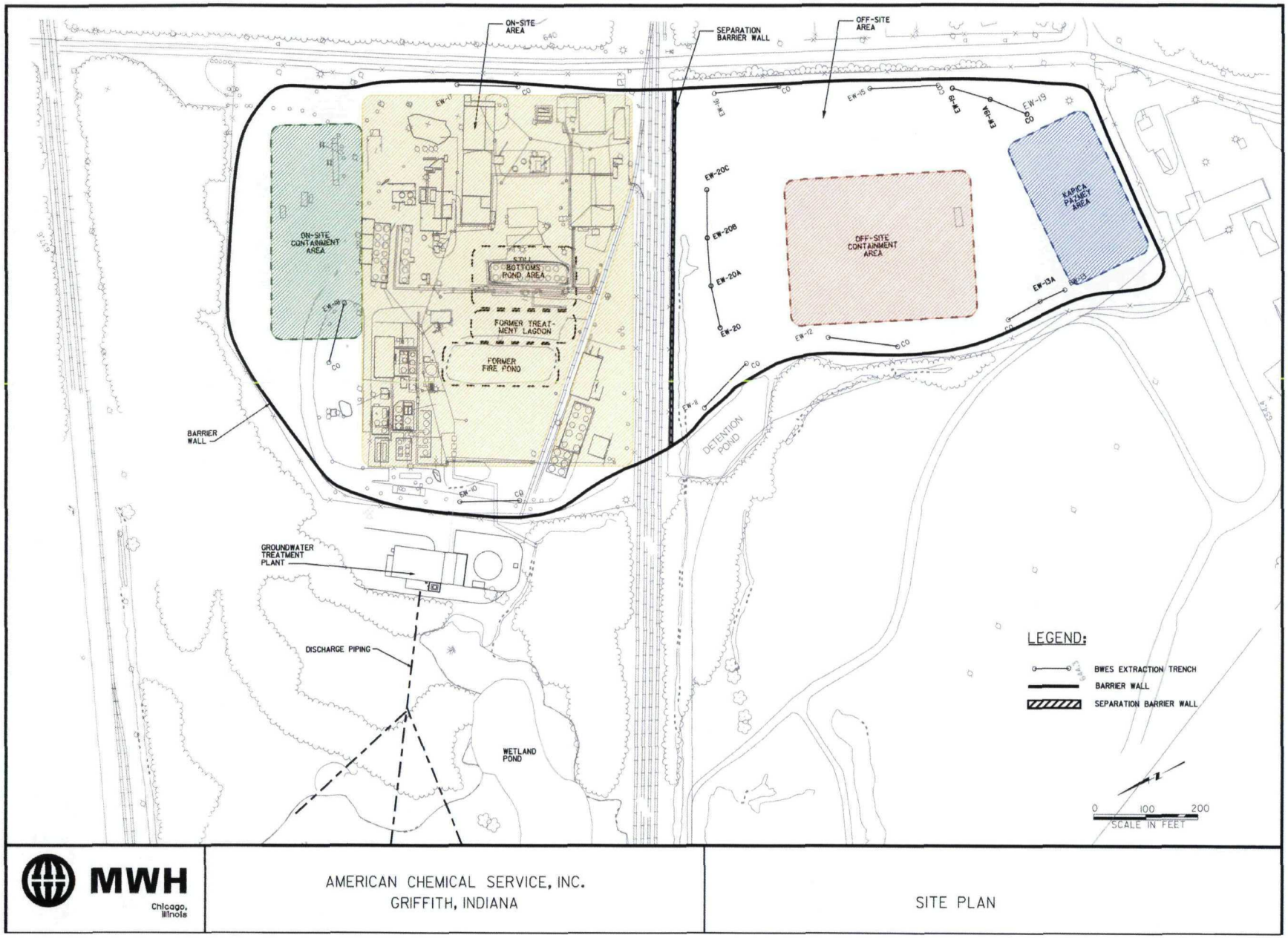
III. Background

Site Characteristics

The ACS site is located at 420 S. Colfax, Griffith, IN (see **Figure 1a**), about 40 miles southeast of Chicago, IL. The site is comprised of about 19 acres of ACS-owned or leased property which includes the so-called "Off-Site Containment" and the "On-Site Containment" areas, the 2-acre property known as the "Kapica-Pazmey" property, and portions of CSX Transportation Company-owned land that had been impacted by past ACS waste disposal practices (see **Figure 1b**).

Colfax Street borders the site on the east. An ACS-owned rail spur bisects the site in a northwest-southeast direction, between the fenced "On-Site" and "Off-Site" areas. Further to the west, south of the rail spur, the site is bordered by the active portion of

Figure 1a: 420 S. Colfax, Griffith, IN.
Figure 1b: ACS Site Plan (next page)



MWH
Chicago, Illinois

AMERICAN CHEMICAL SERVICE, INC.
GRIFFITH, INDIANA

SITE PLAN

the Griffith municipal landfill. Wetlands border the site to the west of the ACS facility and north of the rail spur. The northern boundary of the site is formed by the Canadian National Railway (formerly the Grand Trunk Railway).

Land and Resource Use

ACS currently operates as a specialty-chemical manufacturer in the "On-Site" area. Land around the site is primarily used for commercial purposes and there are several single-family residences nearby on Reder Road. Oak Ridge Prairie Park is located less than a half mile northeast of the site (see **Figure 1a**).

History of Contamination

ACS began as a solvent recovery facility in May 1955. Solvent mixtures containing alcohols, ketones, esters, chlorinated hydrocarbon compounds, aromatic compounds, aliphatic compounds, and glycols were accepted and "reclaimed" by distillation. Many of the compounds had been used as cleaning solvents and so they contained various residual materials. ACS has also operated a series of batch chemical processes at various times during its history. Other processes conducted at the site include epoxidation and bromination operations, and storage and blending of waste-streams for a secondary fuel program. ACS ceased solvent reclaiming activities in 1990 after losing interim status under the Resource Conservation and Recovery Act (RCRA).
ACS manufactured small batches of chemicals in the late 1960s and early 1970s. It also operated two on-site incinerators that burned still "bottoms," or non-reclaimable materials generated from its on-site production unit, and wastes from off-site generators. The first incinerator started operating in 1966, the second in 1968, and together burned approximately two million gallons of industrial waste per year. The incinerators were dismantled in the 1970s.

Several areas on the ACS property were used for disposal of hazardous substances. These disposal areas were identified as potential source areas by U.S. EPA and named: 1) the Still Bottoms Pond Area (SBPA); 2) Treatment Lagoon #1 and adjacent area; 3) the On-site Containment Area (ONCA); 4) the Off-Site Containment Area (OFCA); and 4) the Kapica-Pazmey (K-P) area. The OFCA is owned by ACS; however, it was named the Off-Site Area because it is separated from the ACS facility by a fence and the rail spur. The Off-Site Area includes the OFCA and the K-P property. The On-site Area includes the ONCA, the Still Bottoms Area, Treatment Lagoon #1, and adjacent areas (see **Figure 1b**).

Approximately 400 drums containing sludge and semi-solids of unknown types were reportedly disposed of in the ONCA. The Still Bottoms Pond and Treatment Lagoon #1 received still bottoms from the solvent recovery process. The pond and lagoon were taken out of service in 1972, drained, and filled with an estimated 3,200 drums containing sludge materials. The OFCA was utilized principally as a waste disposal area and received wastes that included on-site incineration ash, general refuse, and allegedly a tank truck containing solidified paint, and an estimated 20,000 to 30,000

drums that were reportedly punctured prior to disposal. Hazardous substances were also disposed directly on the K-P property as part of the drum recycling work conducted there. ACS reportedly ceased on-site disposal practices in 1975.

Initial Response Actions

U.S. EPA, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or Superfund, listed the ACS site on the National Priorities List (NPL) in September 1984. We started a Remedial Investigation (RI) in 1988 and conducted it in three phases. We completed the RI Report, the Baseline Risk Assessment, and a Feasibility Study (FS) in 1992.

Basis for Taking Action

The Risk Assessment and RI/FS report showed that the principle threats at the ACS site included buried drums, buried wastes, contaminated soil and debris, contaminated ground water and contaminated surface water. Buried wastes and contaminated soil and debris were identified as a continuing contaminant source to ground water, a direct contact threat should future excavation occur, and an inhalation threat from migration of volatile contaminants through existing cover material and possible dispersion of contaminants to the neighboring community.

Contaminants of Concern

Hazardous substances that have been released at the ACS site include:

Soil: PCBs, and many chlorinated- and non-chlorinated-volatile organic compounds (VOCs)

Groundwater: Several chlorinated- and non-chlorinated-VOCs, including benzene and chloroethane

Sediment: Polychlorinated biphenyls (PCBs)

Contaminant Exposures

Actual or potential human exposures to contaminants in sediments, soil, and groundwater are associated with human health risks due to levels that exceeded U.S. EPA's risk management criteria[1] under reasonable exposure scenarios.

[1] Whereby excess carcinogenic risk exceeds the risk range of 1×10^{-4} to 1×10^{-6} and/or non-carcinogenic hazards exceed a hazard index (HI) of 1.

IV. Remedial Actions

Remedy Selection and Implementation

U.S. EPA issued a Record of Decision (ROD) on September 30, 1992. Some of the ACS PRPs conducted Pre-Design Investigations during 1995 and constructed voluntary site stabilization activities during 1996 and 1997. We issued a ROD Amendment in July 1999 and later issued an Explanation of Significant Difference (ESD) to the ROD in September 2004.

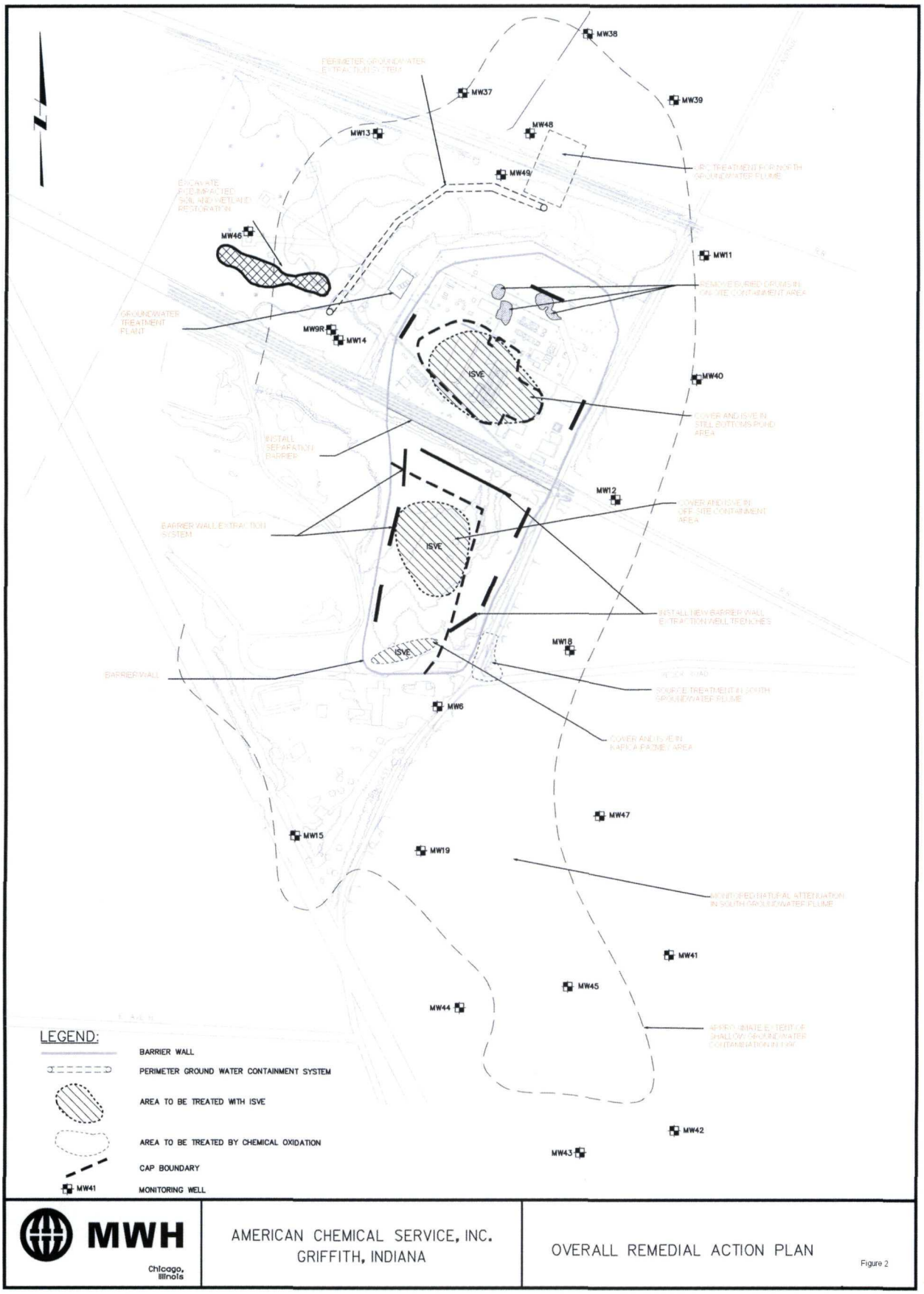
We discussed the 1992 remedy and our reasoning behind issuing the 1999 ROD Amendment in the first Five-Year Review for the ACS site (April 2001). Generally, in 1992 we selected a complete cleanup action for the site with cleanup levels or goals that allowed for UU/UE future site use. Later pre-design studies showed this approach to be not cost-effective, possibly unsafe to implement, and in some cases, technically impracticable. We therefore selected a combined containment and treatment remedial action for the on-site areas in the 1999 ROD Amendment and we later slightly modified the off-site groundwater cleanup approach in the 2004 ESD. The amended remedy relies on the use of institutional controls (ICs) with regard to future site use to be protective of human health and the environment.

U.S. EPA reached a cleanup agreement for the ACS site in a RA Consent Decree with over 40 ACS PRPs ("ACS Settling Defendants") in January 2001. Earlier, many of the ACS Settling Defendants had designed and then constructed certain aspects of the amended cleanup remedy while also conducting the pre-design studies. They installed a subsurface barrier wall around the ACS property in 1997 and they installed the interim groundwater extraction system inside the barrier wall ("Barrier Wall Extraction System" or BWES) to dewater the area to prevent movement of contaminated groundwater over and outside of the wall. They also installed an interim groundwater extraction system (the "Perimeter Groundwater Containment System" or PGCS) in the northern area of the site to control the movement of the more highly impacted groundwater in this area. Water pumped from both systems was pumped to an on-site treatment plant (the "Groundwater Treatment Plant" or GWTP) to remove the chemical contaminants before the cleaned water was discharged into the wetlands.

Figure 2 (next page) displays the overall site cleanup approach selected in the amended ROD. Construction of the final remedial actions is discussed in Section V.

Operation and Maintenance (O&M)/Monitoring Program

U.S. EPA established a groundwater monitoring program for the interim phase (pre-2001) of the cleanup action. Groundwater and treated effluent were monitored on a periodic basis to ensure treatment effectiveness. Water level monitoring also tracked whether the barrier wall was performing as designed. Analytes included the chemicals of concern listed in the ROD and those parameters required under a discharge "permit"


MW38
MW37
MW39
MW13
MW48
MW49
MW46
MW11
MW9R
MW14
ISVE
MW40
MW12
ISVE
ISVE
MW18
MW6
MW47
MW15
MW19
MW41
MW45
MW44
MW42
MW43
LEGEND:
BARRIER WALL
PERIMETER GROUND WATER CONTAINMENT SYSTEM
AREA TO BE TREATED WITH ISVE
AREA TO BE TREATED BY CHEMICAL OXIDATION
CAP BOUNDARY
MW41
MONITORING WELL
MWH
Chicago, Illinois
AMERICAN CHEMICAL SERVICE, INC.
GRIFFITH, INDIANA
OVERALL REMEDIAL ACTION PLAN
Figure 2

issued by IDEM for the GWTP. (An updated groundwater monitoring program is in place now that the remedial action is complete.) We reviewed the current O&M program and discuss our findings in Section VI.

V. Progress Since the Last Review

U.S. EPA completed the first Five-Year Review for the ACS site in April 2001. At that time the RA Consent Decree had just been entered (made binding by the U.S. District Court) in January 2001 and construction of the final remedial actions had begun. Thus, we stated in the first Five-Year Review that:

> "With the pending construction of the final remedial action components and the continuing operation of the barrier wall and the groundwater extraction and treatment systems pursuant to the ROD, as amended, as designed, the remedy selected for the ACS site remains protective of human health and the environment."

We recommended that the (pending) remedial actions be constructed and operated as designed and to also continue to operate the groundwater treatment system until groundwater cleanup levels are achieved.

Our recommendations have been carried out, for the following cleanup actions (both remedial construction and pilot studies) were constructed at the ACS site during the period 2001-2005:

January 2001 - A 700-foot slurry wall ("separation barrier wall") was constructed east to west at the north end of the Off-site Containment Area (OFCA), thereby separating the active On-Site Area from the OFCA. The overall de-watering effort inside the main barrier wall became easier to control with the site divided into two parts.

February-March 2001 - Several additions were made to the BWES to enhance its efficiency after the separation barrier wall was completed. Extraction capacity in the OFCA was increased by adding two extraction trenches south of this barrier wall.

April-May 2001 – A drum removal was conducted. A total of 249 intact drums and 1,449 non-intact drums were excavated from two areas in the On-Site Area. The intact drums were over-packed, sampled for characterization, and sent off-site for incineration. The non-intact drum material was cut into smaller pieces, loaded into roll-off boxes, and also sent to the off-site incinerator (see **Figure 3**, next page). Drum locations were refined by test pit excavations in February 2001.

August-September 2001 – Sediment containing PCBs above 1 mg/kg (1 part per million) were removed from the wetland located to the west of the ACS site. After approximately 18 inches of impacted sediments were removed, the 1.5-acre cleanup area was over-excavated to depths of approximately 10 feet to create a pond (see cover photograph).

Figure 3: Drum removal action at the ACS site (May 2001). MWH photograph.

2002-2004 – In-situ soil vapor extraction (ISVE) systems were installed. The main objective of the ISVE system is to extract mobile organic compounds (primarily VOCs but also includes some semi-volatile compounds). The ISVE system works together with the BWES, which lowers the water table within the main barrier wall enclosure to expose more of the buried wastes to the ISVE effects. The system also includes air sparge points to help treat several zones where VOCs were identified at depths below the practical limit to de-water.

The OFCA and K-P Area ISVE system was the first to be installed and it was run for six months to provide operating data to guide the installation of the site-wide ISVE system. After one year of operation, the system performance was evaluated and then enhancements were designed and implemented to maximize extraction and treatment capacity and efficiency.

After the OFCA system had been operating for eighteen months, the SBPA ISVE system was similarly implemented as with the initial system, run for six months followed by evaluation and enhancement to the final system.

The ISVE system will be operated continually until the measured VOC-removal rate drops to 100 pounds per day (lb/day) or less for the combined systems (initial extraction rates were as high as 1400 lb/day). At that point, the ISVE system will be transitioned to a passive system by discontinuing use of the blower system. The seals at the top of each well will be removed, leaving the ISVE wells open to the atmosphere. However, the BWES will continue to operate inside the main barrier wall, removing groundwater to both clean it and keep the inward gradient intact.

2001-2004 – Different types of soil covers were constructed over various parts of the ACS site. First, a temporary one-foot clay cover was placed on most of the Off-Site Area in 2001 following the completion of the separation barrier wall. Next, a permanent cover was placed over the OFCA and K-P Area in 2002 after construction was completed on the ISVE system for this area. The cover included an engineered portion over the areas containing buried waste, and a simple clay and soil cover over the rest of the area that was inside the main barrier wall. The engineered cap consisted of a clay layer covered by a flexible membrane liner (FML) along with a soil cover and vegetation.

A temporary soil cover was placed over the SBPA after installation of the ISVE and the sparge wells. A final asphalt cap was installed over the SBPA in September 2004.

1999-2005 – Various groundwater cleanup actions were implemented or existing systems were enhanced. Benzene is one of the main contaminants of concern in the ACS area groundwater. Two groundwater contaminant plumes ("northern" and "southern") were identified in the area water table ("upper") aquifer and one contaminant plume was identified in the confined ("lower") aquifer beneath the upper aquifer. After completing the installation of the main barrier wall and interim groundwater pump-and-treat measures in 1997, the ACS Settling Defendants conducted several treatability studies to assess the applicability of new and additional technologies for groundwater cleanup.

The PGCS collects contaminated water from the northern upper aquifer plume outside the barrier wall and helps prevent further off-site migration of the contaminant plume. A pilot study was conducted in 1999 to evaluate the use of oxygen release compounds (ORC) to treat the north area groundwater by in-situ oxidation technology. Results were mixed, however, and groundwater monitoring has shown that contaminant concentrations have decreased by more than an order of magnitude since the main barrier wall and the PGCS were installed. Therefore, the northern upper aquifer plume will be addressed with the existing pump-and-treat (the PGCS) technology and monitored natural attenuation (MNA).

An ORC pilot study was conducted in the southern upper aquifer plume outside the barrier wall during 2001. While the ORC was able to dramatically reduce the benzene concentrations in the groundwater immediately after application, it was found that the benzene concentrations in groundwater rebounded after approximately six months. Subsequent soil investigations showed that there were residual organic compounds including benzene trapped in a "smear zone" at or above the water table in the south

area, extending about 200 feet out beyond the barrier wall under the Colfax Street roadway. The smear zone acted as a constant source of new contaminants to the groundwater during high groundwater events. It was determined that the ORC reagents would not be effective in addressing the smear zone contaminants.

A second pilot study was conducted in the southern upper aquifer plume area in April 2004 to test the effectiveness of a modified Fenton's Reagent, which is a more aggressive, in-situ chemical oxidation technology. The pilot study results indicated that the modified Fenton's Reagent was effective at destroying the smear zone source area contaminants and a full-scale in-situ remedial program was developed using the pilot study data.

A full-scale application of the modified Fenton's Reagent was completed in September 2004 and additional full-scale applications were made in April and August 2005. Post-application sampling to evaluate the effectiveness followed each application. The full-scale chemical oxidation injections resulted in significant decreases in benzene and hydrocarbon concentrations. A final application of the modified Fenton's Reagent is scheduled for Spring 2006 and it is projected that the southern upper aquifer plume will then be addressed through MNA.

A groundwater investigation including an aquifer pump test was begun in 2005 to help determine how to prevent the off-site migration of benzene in the lower aquifer in the northern part of the site. Pending results of the testing, the previously existing monitoring wells, new temporary monitoring wells, and the piping installed for the pumping test are planned to be available components of an extraction system that could be designed to achieve hydraulic control and groundwater cleanup in this area.

VI. Five-Year Review Process

Administrative Components

U.S. EPA began the second Five-Year Review at the site in September 2005. Earlier in the year the site remedial project manager (RPM), during routine discussions about the various parts of the ACS site, verbally notified the ACS Settling Defendants and IDEM that he was beginning the review and that they were encouraged to comment on the review process. We also sent IDEM a letter in May 2005 to announce our intention to undertake the second Five-Year Review. The notice letter is in the ACS site files.

Community Involvement

U.S. EPA notified the Griffith community that we were conducting the second Five-Year Review by placing an advertisement on February 3, 2006, in *The Times of Northwest Indiana*, a newspaper of general circulation. An ad copy is in the ACS site file. We invited community members to submit any comments to us. No comments were received. We will place a copy of the completed second Five-Year Review Report into the ACS site informational repository for public view.

Document Review

U.S. EPA reviewed many site-related documents for this Five-Year Review (see Attachment for List of Documents Reviewed). Importantly, because remedy construction had just begun in January 2001 and was completed in September 2005, we have effectively reviewed the protectiveness of the site remedial actions on an almost continual basis during the last 5 years. We received monthly progress reports from the ACS Settling Defendants (in accordance with the consent decree) that discussed cleanup progress and also provided operating efficiency information for the main barrier wall (relative water level measurements) and the GWTP (effluent concentrations). We also held weekly construction meetings at the site to discuss construction progress and health and safety considerations of all pending and ongoing remedial work.

The ACS Settling Defendants submitted a construction completion report to document completion of individual remedial components as each completion occurred. They submitted a total of ten construction completion reports and also submitted a final Remedial Action Report to document completion of the site remedial action. U.S. EPA reviewed these reports to determine that the remedial action was constructed as designed and to help assess the protectiveness of the site remedy.

Data Review

U. S. EPA reviewed operating data pertaining to three major portions of the site remedial action – the containment actions, the groundwater cleanup actions, and the soil cleanup actions. We also reviewed an Institutional Controls Study that the ACS Settling Defendants had recently performed at our request. Generally, the data indicate that the various soil covers have been regularly inspected and repaired as necessary; the main barrier wall is containing contaminants within; the GWTP has been running continuously for the last five years (except during maintenance periods); the GWTP effluent meets permitted discharge levels except for the very occasional exceedance; the ISVE system has been very successful in removing VOCs from the ground; the ISVE system thermal oxidizers are 99+% efficient in destroying the influent VOCs and have not exceeded permitted discharge levels; and, the groundwater monitoring program shows that contaminant levels outside of the main barrier wall have not impacted adjacent private drinking water wells and have been decreasing since the wall was installed. The Institutional Controls Study is nearly complete and we reviewed it to see whether all impacted properties have recorded restrictions and notices on the deeds to help prevent disturbance of the ACS remedial actions during future site use.

Discussion concerning specific remedial action operations follows:

A. **Containment Actions**

1. Soil Covers

The various types of engineered soil covers placed on the ACS site were designed and constructed to accomplish the following objectives:

- Eliminate potential direct contact with contaminated soil
- Eliminate potential direct contact with VOC-contaminated groundwater
- Reduce the potential for soil contaminant migration to groundwater by reducing infiltration into highly impacted areas, and
- Provide a surface seal for the ISVE system to minimize potential short-circuiting and maximize the capture of VOC vapor

Our review of the individual construction completion reports (see Attachment 1, Items 11, 15, 16 and 18) verify that the various engineered soil covers were constructed in accordance with the Final Design.

Our review of monthly reports (and quarterly reports, as appropriate) verify that the ACS Settling Defendants regularly performed the following activities as part of an overall program to demonstrate that the engineered soil covers were performing as designed:

- Monitoring of vacuum level and air flow through the ISVE system (high vacuum levels would indicate little or no short-circuiting through the soil covers)
- Monitoring water levels in wells and piezometers within the boundaries of the cover (higher than expected water levels would indicate excess infiltration is occurring), and
- Regular quarterly inspections and spot inspections after major storm events (to check for cracking or erosion)

Reviewed data indicate that the engineered soil covers have accomplished the remedial objectives since installation and that immediate repair, if any, is made as necessary due to erosion or cracking.

2. Barrier Wall/Barrier Wall Extraction System

The BWES was installed inside the main barrier wall to help maintain hydraulic capture within the wall. The BWES is comprised of eight 100-foot long extraction trenches, one 150-foot long extraction trench, and one 350-foot long extraction trench. Until the site-wide dewatering effort occurred, there was not consistent hydraulic capture within the wall (i.e. in some areas groundwater levels were higher inside the wall than directly on the other side). Since the dewatering effort began, data show that water levels are mostly 2-6 feet higher on the outside of the barrier wall than inside, creating hydraulic capture. Generally, the only area not achieving full hydraulic capture is near where the PGCS is operating because it also tends to lower the water table in that area. However, this is acceptable because the barrier wall hasn't been shown to be leaking. Hydraulic

capture will be achieved in this area once we no longer need to operate the PGCS.

The groundwater sampling data demonstrate that the main barrier wall and the BWES are working to contain contaminants inside the main barrier wall. Results from several monitoring wells outside the barrier wall, but inside the impacted groundwater zones, show that concentrations in groundwater contaminant plumes are decreasing. Results from certain other upgradient, downgradient, and side-gradient monitoring wells have been consistently free of site-related contaminants, indicating that groundwater contaminants have not moved outside of the barrier wall.

The ACS Settling Defendants regularly perform O&M activities on the BWES to maintain its effectiveness. This work includes evaluation and routine maintenance of pumps installed in the BWES trenches.

B. **Groundwater Cleanup/Monitoring Actions**

1. Pump-and-Treat

Pump-and-treat systems have been operated at several locations in the upper and lower aquifer over the past ten years. The PGCS has captured impacted groundwater in the upper aquifer since 1997. Individual pumps have been operated in three lower aquifer monitoring wells to remove localized concentrations of benzene. Groundwater monitoring data show that the pump-and-treat systems have been effective at removing or reducing contaminant levels in the affected aquifers. Thus, the pumping will be continued until contaminant concentrations are reduced enough in the impacted areas to support a transition to MNA.

2. Groundwater Monitoring

The ACS Settling Defendants regularly perform groundwater monitoring activities in accordance with the Consent Decree. They currently sample selected groundwater monitoring wells on a semi-annual basis although previously they sampled groundwater on a quarterly basis. Sixteen upper aquifer wells and 16 lower aquifer wells are sampled and analyzed for indicator VOCs (benzene, chloroethane, tetrachloroethene, trichloroethene, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, and vinyl chloride). Semi-volatile organic compounds (SVOCs) and metals are sampled from selected wells on an annual basis. Water level measurements are also taken on a quarterly basis to confirm that the PGCS is capturing the northern upper aquifer plume.

Reviewed data indicate that the PGCS has been effective in preventing further off-site migration of contaminants in the groundwater. While some contaminant levels have shown variability, no upward trends exist and some results show decreasing concentration trends.

A lower aquifer investigation was conducted during August and September 2005 to both determine the width of the benzene plume in the lower aquifer at the northern property

line and to provide data to help determine the best method to hydraulically contain or clean up the plume. The results of the lower aquifer investigation will be used to design an appropriate system to address the benzene plume.

3. Groundwater Treatment Plant (GWTP)

The GWTP was constructed in 1997 to handle limited flow volumes and low-level contaminant loads from the initial pump-and-treat approach taken at the ACS site while certain pre-design studies were underway. Significant treatment method changes were then completed in December 2000 to meet the expected increases in both the quantity of groundwater to be treated and the contaminant levels in the water as the amended remedy was constructed and operated. The GWTP treatment train consists of the following steps: flow equalization, free-phase product removal, emulsified-product removal, organic compound removal and destruction, dissolved metals removal, solids removal and handling (for off-site disposal), disinfection and discharge, and air emissions control.

The GWTP was designed and constructed to reduce the contaminant levels in the groundwater that the BWES and PGCS (including the 3 lower aquifer wells that are pumped) extracts to meet the effluent quality standards established by IDEM and U.S. EPA for the ACS site. Treated water is discharged to the wetlands area near the GWTP.

Compliance monitoring is performed monthly and results are reported monthly to IDEM and U.S. EPA. A review of past effluent sampling results showed that only a few, minor exceedances occurred. In all cases the ACS Settling Defendants immediately addressed the situation to prevent further discharge of non-compliant treated water as well as immediately notifying U.S. EPA of the occurrence and the steps taken to address the situation. The ACS Settling Defendants also collect a yearly sediment sample from the discharge area in the wetlands to assess whether or not PCBs are accumulating (above the 1 ppm cleanup level in the wetland sediment) as a result of the discharge. No PCBs have been noted in these sediment samples.

4. Chemical Oxidation

Section V of this report describes the application of a modified Fenton's Reagent (chemical oxidant) into a part of the southern upper aquifer plume area outside the main barrier wall. Three full-scale applications have been made to treat the hydrocarbons trapped in a four-foot thick "smear zone" at the water table near the intersection of Colfax Street and Reder Road (see **Figure 4**, next page) to prevent the continual re-contamination of the upper aquifer in this area. Post-application sampling results have showed that the hydrocarbon concentrations in the smear zone have been significantly reduced and that downgradient groundwater quality has subsequently improved. For example, prior to the application of the chemical oxidant, benzene levels have ranged as high as 6,000 ppb in groundwater samples taken from Monitoring Well #06, the monitoring well that best detects contaminant leaching directly from the smear zone.

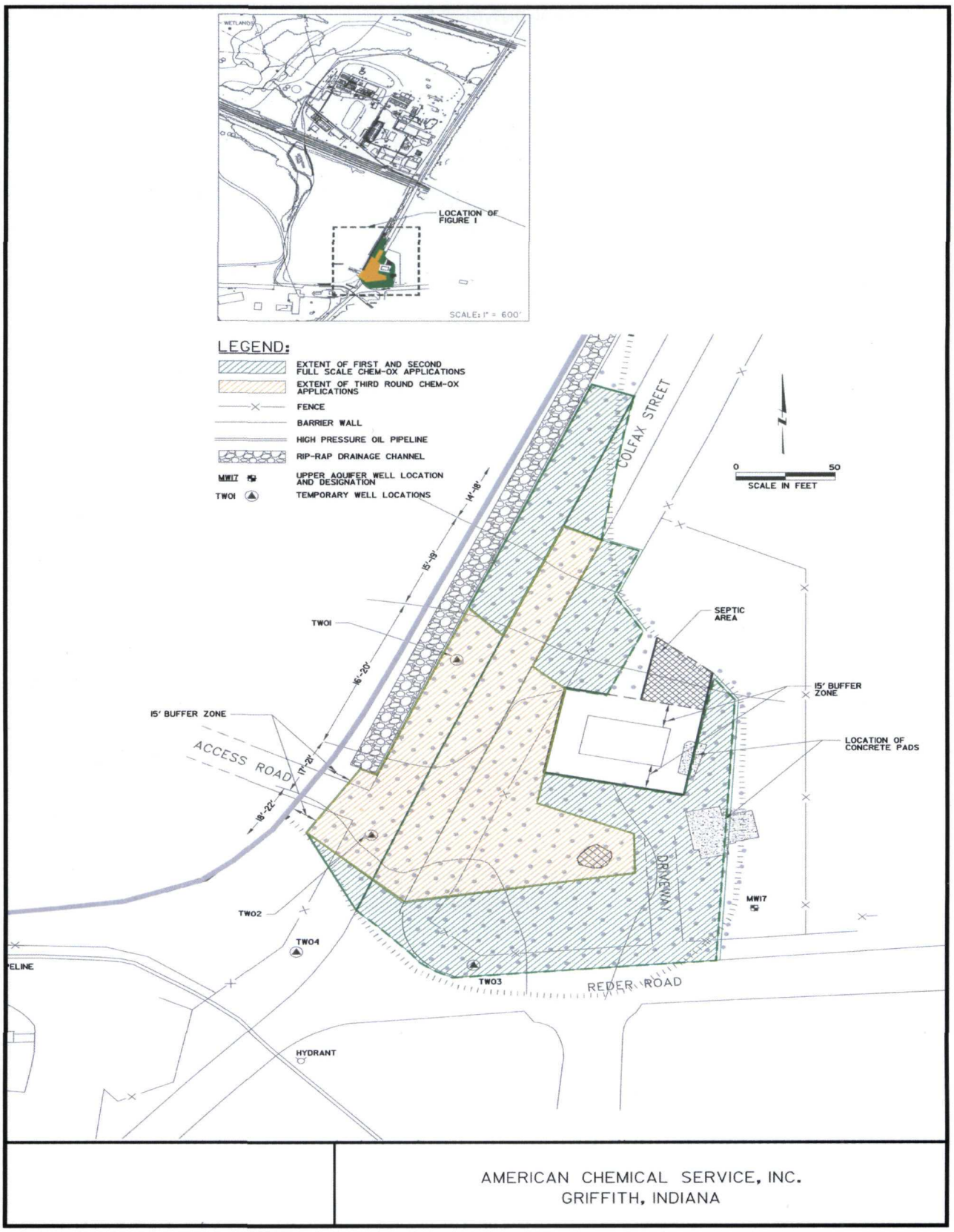


Figure 4: Chemical oxidant injection area. Note location of home.

Benzene was not detected in the groundwater sample taken from this well during the March 2005 groundwater sampling event.

Post-application sampling of the third application occurred in October 2005 and a report summarizing sampling results is pending submittal to U.S. EPA. Additionally, a fourth application of the chemical oxidant is planned to occur in Spring 2006 to further destroy the hydrocarbons in the smear zone. Upon completion of the full-scale chemical oxidant applications, the southern upper aquifer contaminant plume will be addressed through MNA.

5. Monitored Natural Attenuation

The 1999 ROD Amendment changed the on-site groundwater cleanup approach to a containment remedy rather than a restoration remedy. The 2004 ESD changed the off-site groundwater cleanup approach from solely pump-and-treat to a combination of pump-and-treat, chemical oxidant application, and MNA. The MNA step has yet to begin and we will likely address it in the next Five-Year Review report for the ACS site.

6. Residential Well Monitoring

A small number of homes along Reder Road near the ACS site are located over or near the southern upper aquifer groundwater contaminant plume. Many are on private wells that draw water from the lower aquifer (which is not impacted in this area). Five of these homes participate in the yearly residential well sampling event conducted by the ACS Settling Defendants. The water samples are analyzed for low concentration, full-scan parameters. Sampling results are submitted to U.S. EPA as soon as they have been received and validated by the ACS Settling Defendants in accordance with the consent decree. U.S. EPA reviews the results and mails each resident their individual results along with a discussion of what chemical compounds may have been reported in their water sample.

U.S. EPA compares the residential well sample results to the groundwater cleanup levels for the ACS site (generally the Maximum Contaminant Levels under the Safe Drinking Water Act) and to other risk-based levels as appropriate. None of the private well water samples have indicated that the ACS facility has had any effect on the homes' private wells; although in 2002 most samples reportedly had low levels of some VOCs in them. However, these "hits" were shown to be due to laboratory equipment being improperly cleaned before sample analysis because the ACS Settling Defendants re-sampled the wells and the second round of samples was found to be clean[2] (VOCs were not detected).

C. **In-situ Soil Vapor Extraction**

Two ISVE systems were installed at the ACS site to reduce the mass of VOCs in three

[2] See the "Groundwater Monitoring Summary Report – September 2002 ACS NPL Site – Griffith, Indiana" by MWH, dated March 2003, which is part of the Administrative Record for the ACS site.

source areas (SBPA, OFCA, and K-P Area) below the ground surface and inside the main barrier wall. Reducing the VOC mass within the barrier wall helps to reduce the possibility of VOCs breaching the barrier wall in the future. Extracted VOCs are conveyed to two thermal oxidizers that are located in the GWTP building and which destroy the VOCs prior to atmospheric release. Operation of the ISVE systems will continue until the total removal rate has been reduced to the goal of 100 pounds per day or less for the combined systems. **Figure 5** (next page) shows a chart of the measured extraction levels based on pre-treated vapor samples taken from the ISVE systems. Extraction rates have been as high as 1400 pounds per day.

Some of the ISVE system wells have the capability of removing groundwater as well as soil vapor. These wells, termed Dual Phase Extraction (DPE) wells, and the BWES dewater the upper aquifer in the vicinity of the ISVE systems. Lowering the water table exposes more of the soil VOC contaminants to the vacuum imparted by the ISVE systems and creates air flow pathways through the soil and wastes, increasing the effectiveness of the ISVE system. Pumped water is directed to the GWTP for treatment.

The ACS Settling Defendants take compliance monitoring samples of treated air streams from the thermal oxidizers to demonstrate that off-gas emissions meet allowable discharge levels under an IDEM "air permit." The compliance monitoring consists of the sampling and analysis of the inlet and outlet vapor streams of the thermal oxidizers. Results are reported to U.S. EPA and IDEM. The results are also used to determine the overall destruction efficiency of the thermal oxidizers and as indicators for the need for maintenance or repair.

The vapor samples are collected and submitted to a laboratory for VOC and SVOC analysis on a monthly basis. (Collection of the effluent sample is not required when the system is down for maintenance.) The IDEM air quality standards (as specified in Rule 326 Indiana Administrative Code [(IAC) 2-1-1(b)(3)(A)]) state that VOC emissions cannot exceed 3 pounds per hour or 15 pounds per day or 25 tons per year. Reviewed data indicate that the thermal oxidizers usually achieve a 99% or higher destruction efficiency rate and that the 3 pounds-per-hour criterion has not been exceeded.

Figure 6 (follows Figure 5) shows the total estimated mass of VOCs removed from the ACS site by the ISVE systems. As of January 1, 2006, the ISVE systems have removed and destroyed an estimated 650,000 pounds of VOCs. The ACS Settling Defendants project that the ISVE system will need to be operated for another 5-8 years to reach the VOC-extraction goal of 100 pounds per day or less[3].

The ACS Settling Defendants regularly inspect and maintain the ISVE system components in accordance with the consent decree. Regular O&M activities include

[3] The 100 pound per day goal is set forth in the U.S. EPA-approved Remedial Design Report (August 1999). At this point it is generally more efficient to operate the ISVE system as a passive venting system and to allow the barrier wall extraction system to collect and remove the VOCs dissolved in groundwater inside the barrier wall.

Figure 5: VOC Removal Rates - ISVE Systems
American Chemical Service, Inc. Site, Griffith, IN

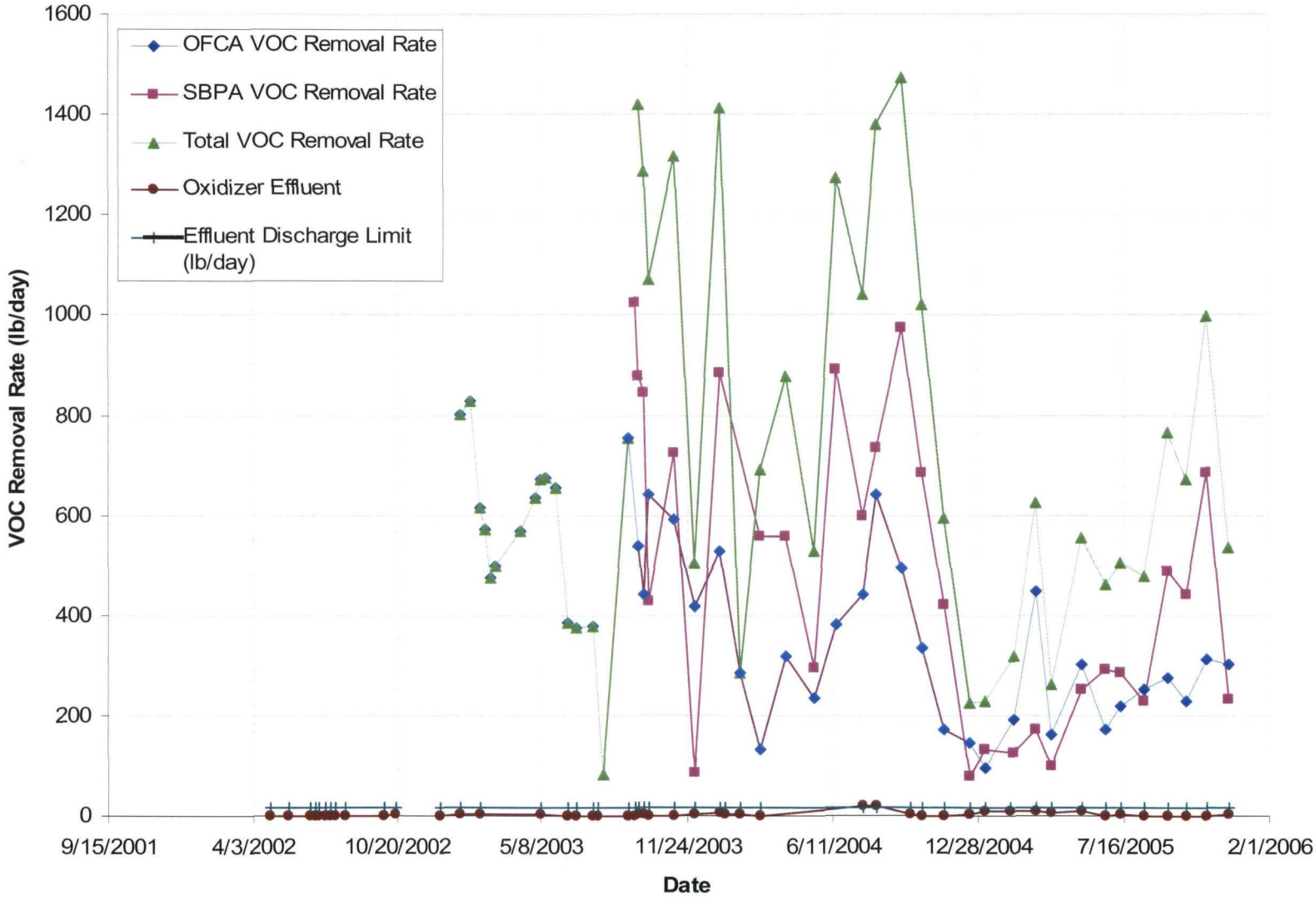
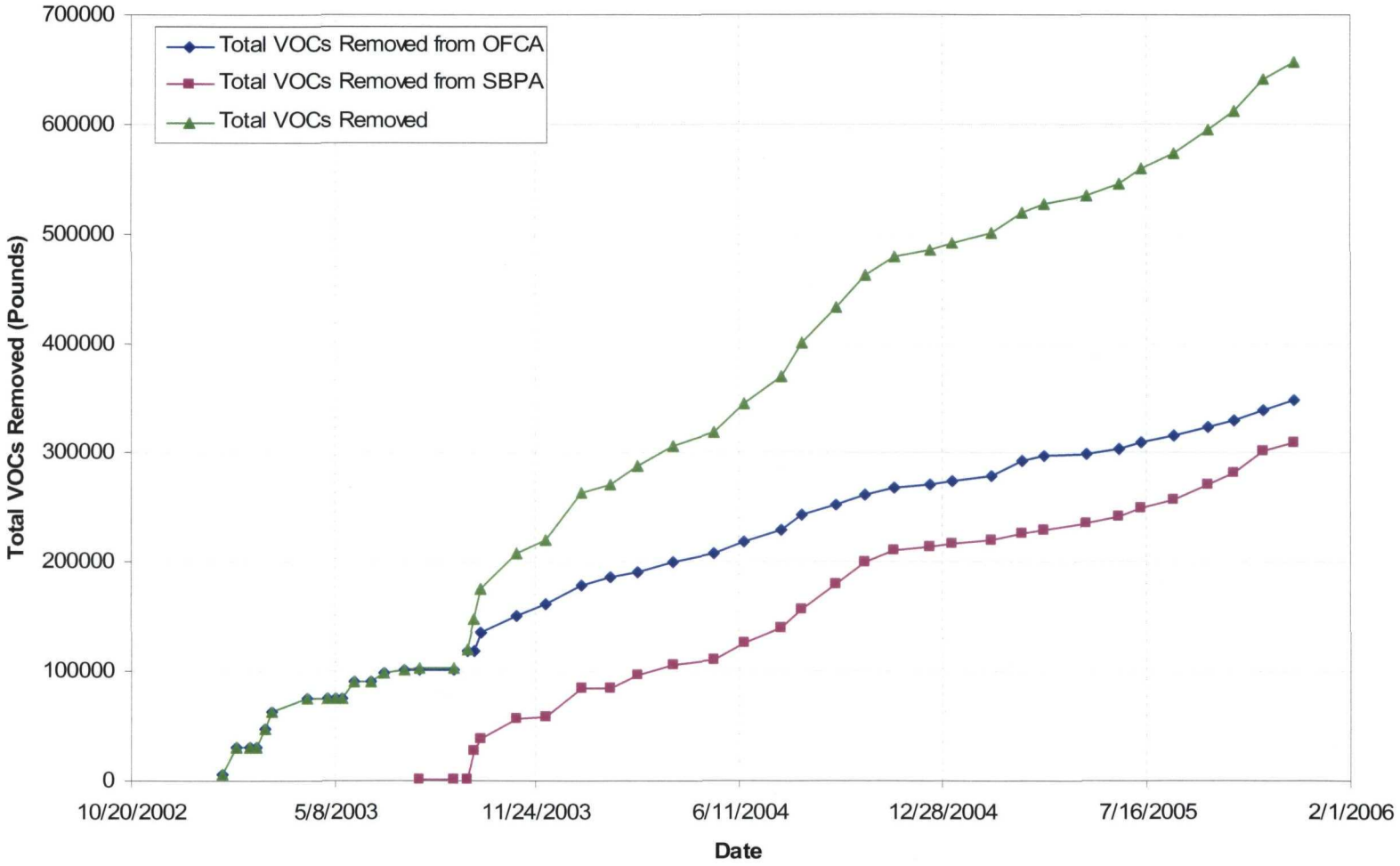


Figure 6: Total VOCs Removed by ISVE
American Chemical Service, Inc. Site, Griffith, IN



evaluation of equipment operation parameters, routine maintenance of equipment, and responding to system alarms or shutdowns as well as taking the monthly emissions compliance samples. Review of data from the monthly reports and quarterly operating reports show that the vapor stream going through the thermal oxidizers is very corrosive. One thermal oxidizer had to be completely replaced as the insides were completely corroded. A second thermal oxidizer has recently developed "pin hole" leaks due to internal corrosion. Repairs are being made and alternative metallic replacement parts are being evaluated for use inside the thermal oxidizers to combat the high corrosion rates.

D. **Institutional Controls**

U.S. EPA requires that land-use restrictions, or Institutional Controls (ICs) be paced on a site where the implementation of an engineered remedy does not allow for UU/UE. Thus, an area of a site which has residual contamination above UU/UE levels would have an IC placed on it. ICs are legal or administrative controls which protect an engineered remedy or control the future use of a property. Since the commercial/ industrial area within the ACS property boundary (see **Figure 7**) will remain after the remedy is completed, ICs consisting of proprietary controls in the form of restrictive covenants to restrict future land and groundwater use will serve to protect the engineered remedy, therefore preventing exposure to residual contaminants at the site.

U.S. EPA placed the following language in the 1999 ROD Amendment concerning institutional controls:

> "A deed restriction will be maintained on the ACS property so that the future use of the property will be restricted to those activities which do not interfere with the performance of any cleanup activities listed in the 1992 ROD and this ROD Amendment, or disturb the integrity of the soil cap to be placed over the site."

Later, the following paragraph was placed into the 2001 Consent Decree:

> "Owner-Settling Defendants have previously recorded deed restrictions which preclude residential development at the Site, use of ground water for potable purposes, and any interference with the final remedial action. Owner-Settling Defendants shall maintain these previously recorded deed restrictions as already imposed, until such time as EPA determines that they are no longer necessary. Commencing on the date of lodging of this Consent Decree, Owner-Settling Defendants shall refrain from using the Site, or such other property, in any manner that would interfere with or adversely affect the integrity or protectiveness of the remedial measures to be implemented pursuant to this Consent Decree. Nothing herein is intended to modify or eliminate Owner-Settling Defendant's pre-existing obligations with respect to these deed restrictions. If EPA determines that land/water use restriction in the form of state or local laws, regulations, ordinances or other governmental controls are needed to implement the remedy selected in the ROD and /or amended ROD, ensure the integrity and protectiveness thereof, or ensure non-interference therewith, Settling Defendants shall cooperate with EPA's and the State's efforts to secure such governmental controls."

Note: Owner-Settling Defendants include ACS, Inc. and CSX Transportation Company. Zarja and Nadzda Djurovic own the K-P Area (see **Figure 7**).

U.S. EPA placed the institutional control ("deed restriction") requirement into the ROD Amendment as a protectiveness measure to be used in concert with the containment and active treatment methods to provide for the protection of human health and the environment at the ACS site. Prior to the consent decree the ACS PRPs had asserted that they already had obtained voluntary deed restrictions on the impacted areas of the ACS site. The consent decree, however, made the institutional controls a binding requirement on the ACS Settling Defendants.

We require an IC Study to be performed as part of the Five Year Review process. The IC study examines the purpose and objectives of the ICs, whether the ICs have been implemented and if so, whether they achieve the stated objectives, and whether the ICs are adequately monitored and enforced.

We requested the ACS Settling Defendants to perform an Institutional Controls Study for the ACS site in Fall 2005. The ACS Settling Defendants complied with our request and submitted their Institutional Controls Study to us in November 2005. The Institutional Controls Study contains a map showing the areas subjected to the ICs and copies of the actual ICs that were recorded with Lake County, IN. The ICs state that the ICs cannot be removed without permission of U.S. EPA and IDEM. The study also contains documentation that the ICs preclude residential development at the site, the use of groundwater for potable purposes, and any interference with the final remedial actions.

However, the ACS Settling Defendants' IC Study is not complete. We had requested as part of the Institutional Controls Study that the ACS Settling Defendants perform a title evaluation (for information-only purposes) to independently document that the ICs "run with the land" and that no parts of the site had been sold or transferred. The ACS Settling Defendants IC Study stated that the ICs "run with the land," and as a proposed alternative to a title search they later submitted to us copies of deeds and limited and conditional property record reports from a title company. They did not perform a title search due to cost concerns and the fact that two of the three landowners are signatories to the consent decree (ACS and CSX Transportation).

The ACS Settling Defendants' IC Study does document the existence of restrictive covenants, but the proposed alternative title review does not adequately document that the existing controls were recorded and free and clear of all liens and encumbrances, or adequately investigate easements and restrictions. We will therefore require that the title evaluation portion of the IC Study be completed to verify the long-term effectiveness of the ICs. We will also determine whether the governmental controls have been implemented in off-site areas and whether they are protective.

As a result of this review, data will be entered into the Institutional Controls Tracking System (ICTS).

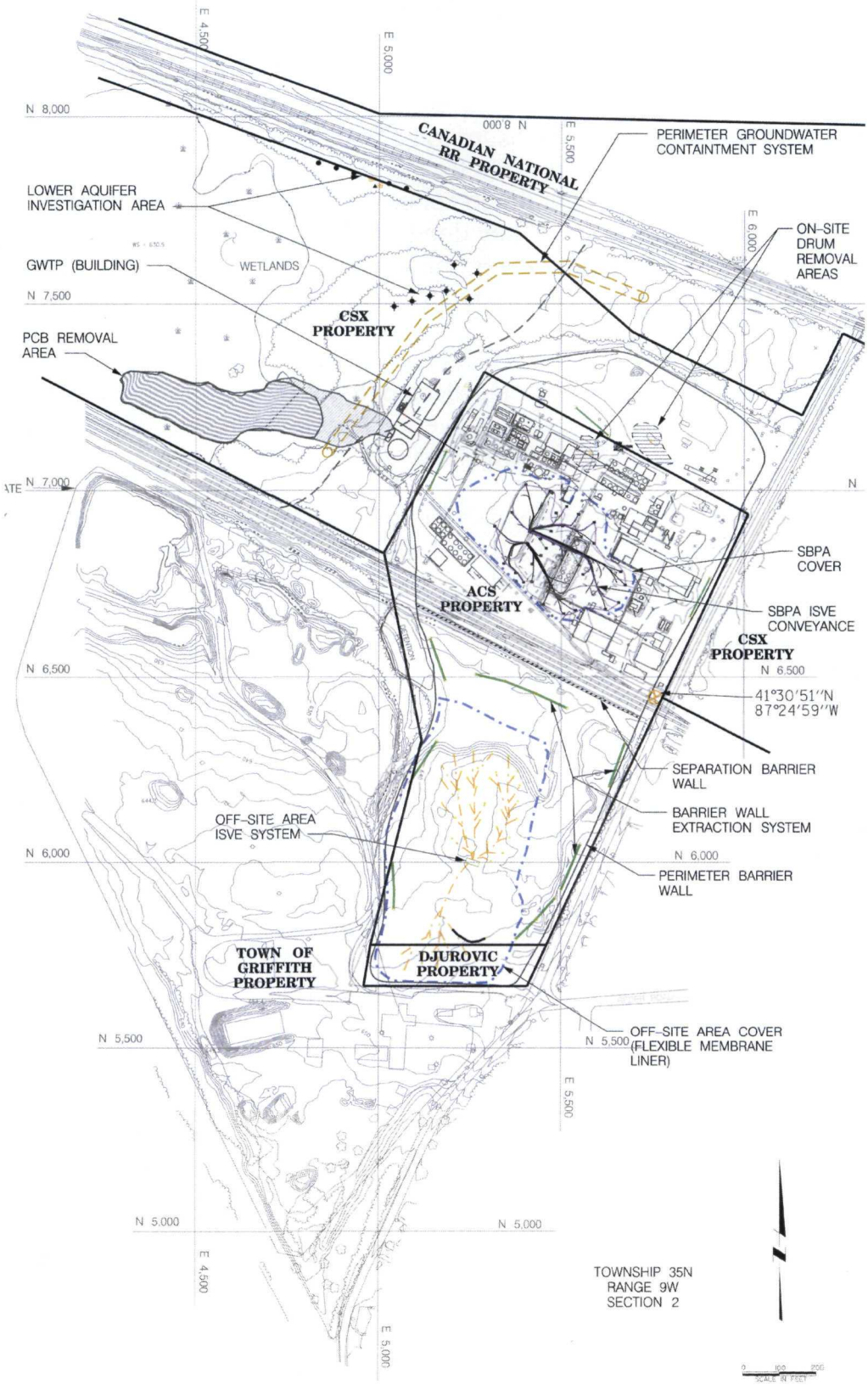


Figure 7: Area property owners map.

E. **Indoor Air Intrusion**

A home located at the intersection of Colfax Street and Reder Road was found to be within the estimated "footprint" of the smear zone in the southern upper aquifer contaminant plume area (see **Figure 4**). U.S. EPA requested that the ACS Settling Defendants evaluate the potential for soil vapor near the house containing VOCs to present an indoor air intrusion pathway. The ACS Settling Defendants followed U.S. EPA's *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (U.S. EPA, November 2002) to evaluate this issue.

First, the ACS Settling Defendants evaluated the smear zone soil sample results to determine whether concentrations of VOCs, specifically benzene, in the soil and groundwater near the house were high enough to warrant collection of soil vapor samples. The results indicated that soil vapor sampling was warranted.

In August 2004 the ACS Settling Defendants conducted a soil vapor sampling round near the house. Sampling results indicated that there was a probable natural gas leak outside the residence and therefore the results of the initial soil vapor investigation were considered anomalous. U.S. EPA recommended that a second round of soil vapor sampling be conducted after the gas leak was repaired. We also suggested that a vapor mitigation system be installed in the basement of the house in case indoor air intrusion was occurring. Similar to a radon mitigation system, the vapor mitigation system would prevent potential intrusion of organic vapors into the house. The system was installed in February 2005.

The second round of soil vapor sampling suggested that soil gas levels were high enough to warrant indoor air sampling in the house. Thus, after the vapor mitigation system had been operating for about six weeks, the ACS Settling Defendants collected an indoor air sample from the basement of the home. An inspection of the basement was also conducted to help identify and remove potential chemical interferences (cleaners, glues, fuels, etc.) to the indoor air sampling event. An ambient air sample was collected outside the house as well.

The analytical results indicated that the VOCs in the ambient indoor air samples did not appear to be the same as those in the soil vapor samples. Also, VOC concentrations were low enough to not warrant further mitigation actions beyond the installation of the vapor mitigation system. U.S. EPA sent the homeowner and renters a copy of the results and we recommended that the vapor mitigation system be continually operated as a precaution.

Site Inspection

U.S. EPA held a site inspection on September 22, 2005, for purposes of conducting the second Five-Year Review and to verify the completion of the RA. At that time we found the final covers over the containment areas to be in good condition and the GWTP and ISVE systems to be operating as designed. We did not see any violations of the ICs that are in place at the site. Site inspection documentation is provided in the *Remedial Action Completion Report* (September 2005).

Other Information

Health and safety has been a continual focus in the ACS project since the beginning of the investigations in 1988, through the completion of remedial construction and on into the future for the O&M and systems monitoring program. A site-specific safety plan was developed for the Remedial Investigation phase in 1988. This plan has been amended and modified to cover each new site activity as investigations or cleanup actions continued. During the final phase of remedial action construction (January 2001 – September 2005) U.S. EPA and the ACS Settling Defendants re-emphasized health and safety by holding weekly construction update meetings and tailgate safety meetings each day site construction or inspection activity occurred. **Figure 8** shows some of the *precautions taken to safely inject the chemical oxidant through the Colfax Street* roadway.

Figure 8: Injection of the chemical oxidant under the roadway on Colfax Street. View is looking north; the ACS site is on the left side. Note the traffic safety features (flagman, traffic cones) used to ensure a safe project. Photograph courtesy of Black & Veatch Special Projects Corp., U.S. EPA's oversight contractor.

U.S. EPA, IDEM, and the ACS Settling Defendants are proud to report that as of January 13, 2006, there have been:

- 3,121 consecutive days with no lost time due to an accident or H&S incident, and
- 844 consecutive days without an incident requiring first aid

Interviews

U.S. EPA did not formally interview members of the public about the protectiveness of the remedial actions at the ACS site for this Five-Year Review.

VII. Technical Assessment

U.S. EPA asked the following three key questions during our technical assessment of the ACS site cleanup to provide the basis for our protectiveness determination(s). Our conclusions are based on the information reviewed in the previous sections:

Question A: Is the remedy functioning as intended by the decision documents?

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Question A - Is the remedy functioning as intended by the decision documents?

Answer A - Yes. U.S. EPA's analysis shows that the ACS site remedy is functioning as intended by the 1992 ROD, as amended by the 1999 ROD Amendment and the 2004 ESD. The containment actions (main barrier wall, BWES) are preventing the further off-site movement of contaminated groundwater, the active treatment systems (ISVE, PGCS, GWTP, chemical oxidant) are effectively removing and destroying soil and groundwater contaminants, and the ICs are in place to help prevent exposure to residual contaminant levels at the site during future site use.

Operation and maintenance of the site remedial actions has been effective. Annual O&M costs varied from year-to-year as each new ISVE system was brought on-line. Generally, the amount of effort needed to keep the thermal oxidizers operating safely is testament to the potential dangers of the site contaminant mass (if left unchecked).

Question B - Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of remedy selection still valid?

Answer B - Yes. We note no changes in cleanup standards and cleanup levels "to be considered" (TBCs) for site contaminants. We also note no changes to contaminant exposure pathways considered in the ROD, as amended.

Question C - Has any other information come to light that could call into question the protectiveness of the remedy?

Answer C - No.

Technical Assessment Summary

The ACS site remedy is functioning as intended by the 1992 ROD, as amended by the 1999 ROD Amendment and the 2004 ESD. There have been no changes to the site physical conditions that would affect the protectiveness of the remedy. There have been no noted changes to exposure assumptions, toxicity data, cleanup levels, and remedial action objectives for the site. There has been no other information that could call into question the protectiveness of the remedy.

Some minor issues exist with the site remedy (see next section). These issues do not affect the protectiveness of the remedy over the short term but should be addressed within a reasonable time frame to help maintain protectiveness over the long term.

Although equipment replacement rates appeared to be normal, the thermal oxidizer output is highly corrosive to the thermal oxidizer systems and sufficient resources will need to be directed to the site by the ACS Settling Defendants (or U.S. EPA, IDEM, and others) to maintain the effectiveness of the remedy.

U.S. EPA will discuss opportunities to optimize the performance of O&M and monitoring tasks with the ACS Settling Defendants during the next Five-Year Review period.

VIII. Issues

Table 2 (next page) presents issues identified during the second Five-year Review.

IX. Recommendations and Follow-up Actions

Table 3 (next page) presents U.S. EPA recommendations and follow-up actions for the issues identified in Table 2.

X. Protectiveness Statement

U.S. EPA has determined that the remedy at the ACS site is protective of human health and the environment because the cleanup is complete and the remedy is operating as designed.

Table 2: Issues

Issue	Affects Current Protectiveness?	Affects Future Protectiveness?
Contaminant plume in lower aquifer under investigation	No	Yes, if left unchecked.
Chemical oxidant application pending	No	Yes, if not performed.
Institutional controls study completion	No	Yes, if not completed.

Table 3: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness?	
					Current	Future
Lower aquifer plume	Complete investigation, recommend and implement response action(s).	ACS Settling Defendants	U.S. EPA and IDEM	December 2006 (installation date)	No	Yes
Chemical Oxidant application pending	Complete final application as planned.	ACS Settling Defendants	U.S. EPA and IDEM	Late Spring 2006 (Target injection date)	No	Yes
Inst. controls study completion	Complete IC study	ACS Settling Defendants and/or U.S. EPA	U.S. EPA and IDEM	Fall 2006	No	Yes

XI. Next Review

U.S. EPA will conduct the third Five-Year Review for the ACS site on or before April 5, 2011, which is five years after the second Five-Year Review.

Attachment

List of Documents Reviewed

1. *First 5-Year Review for the ACS site* (U.S. EPA, April 2001)
2. Monthly Progress and Quarterly O&M and Monitoring Reports (Montgomery, Watson, Harza (MWH), 2001 – 2006)
3. *Record of Decision* (U.S EPA, September 1992)
4. *ROD Amendment* (U.S. EPA, July 1999)
5. *Preliminary Closeout Report* (U.S. EPA, September 2004)
6. *Institutional Controls Study* (ACS Executive Committee, November 2005)
7. *Separation Barrier Wall Installation Construction Completion Report* (MWH, March 2002)
8. *Revised Long-Term Groundwater Monitoring Plan* (MWH, September 2002)
9. *Final PCB-impacted Soil Excavation In the Wetland Area Construction Completion Report* (MWH, November 2002)
10. *(Draft) Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (U.S. EPA, November 2002)
11. *Final Off-Site Area Interim Engineered Cover Construction Completion Report including Spoils Pile Consolidation* (MWH, February 2003)
12. *Final Barrier Wall Extraction System Off-Site Area Upgrades Construction Completion Report* (MWH, March 2003)
13. *Final Buried Drum Removal in On-Site Containment Area Construction Completion Report (*MWH, March 2003)
14. *Off-Site Containment Area and Kapica-Pazmey Area In-Situ Soil Vapor Extraction Systems Construction Completion Report* (MWH, March 2004)
15. *Still Bottoms Pond Area Interim Engineered Cover Construction Completion Report, including Fire Pond Closure* (MWH, March 2004)
16. *Off-Site Area Final Engineered Cover Construction Completion Report* (MWH, June 2004)
17. *Still Bottoms Pond Area In-Situ Soil Vapor Extraction System Construction Completion Report* (MWH, June 2004)
18. *Still Bottoms Pond Area Final Engineered Cover Construction Completion Report* (MWH, January 2005)
19. *Operation & Maintenance Manual, ISVE Systems* (MWH, March 2005)
20. *Health and Safety Field Manual* (MWH, June 2005)
21. *Remedial Action Completion Report* (MWH, September 2005)
22. *Explanation of Significant Difference* (U.S. EPA, September 2004)
23. *Soil Vapor Intrusion Summary Report, 1002 Reder Road* (MWH, October 2005)